Claims

1. A device comprising:

a first electrode having a magnetic moment with a direction that is substantially fixed in response to an applied magnetic field;

a second electrode having a magnetic moment with a direction that is variable in response to said applied magnetic field; and

a tunnel barrier layer separating said first and second electrodes, said tunnel barrier layer including a substantially homogenous, primarily dielectric material including a ferromagnetic element in an atomic concentration of less than five percent.

2. The device of claim 1, wherein said device is a part of an electromagnetic transducer.

3. The device of claim 1, wherein said device is a part of a solid-state memory.

4. The device of claim 1, wherein said tunnel barrier layer includes atoms of aluminum, cobalt and silicon.

5. The device of claim 1, wherein said tunnel barrier layer includes atoms of aluminum and iron.

6. The device of claim 1, wherein said tunnel barrier layer includes atoms of aluminum, iron and silicon.

7. The device of claim 1, wherein said tunnel barrier layer includes an oxidized alloy of aluminum.

8. The device of claim 1, wherein said tunnel barrier layer includes a nitridized alloy of aluminum.

9. The device of claim 1, wherein said tunnel barrier layer includes a nitridized alloy of aluminum, and said alloy is a single phase solid at 600ºC.

10. The device of claim 1, wherein said second electrode has an easy axis of magnetization that is substantially parallel to said magnetic moment direction of said first electrode.

11. The device of claim 1, wherein said second electrode has an easy axis of magnetization that is substantially perpendicular to said magnetic moment direction of said first electrode.

12. The device of claim 1, wherein at least one of said first and second electrodes includes a half-metallic magnet.

13. The device of claim 1, wherein said tunnel barrier layer includes a half-metallic magnet.

14. A device comprising:

a first ferromagnetic layer having a magnetic moment with a direction that is substantially fixed in response to an applied magnetic field;

a second ferromagnetic layer having a magnetic moment with a direction that is variable in response to said applied magnetic field; and

a dielectric layer separating said first and second ferromagnetic layers and having a thickness of less than three nanometers, said dielectric layer including a ferromagnetic element substantially uniformly dispersed in said dielectric layer at an atomic concentration of less than about five percent.

15. The device of claim 14, wherein said device is a part of an electromagnetic transducer.

16. The device of claim 14, wherein said device is a part of a solid-state memory.

17. The device of claim 14, wherein said second ferromagnetic layer has an easy axis of magnetization that is substantially parallel to said magnetic moment direction of said first ferromagnetic layer.

18. The device of claim 14, wherein said second ferromagnetic layer has an easy axis of magnetization that is substantially perpendicular to said magnetic moment direction of said first ferromagnetic layer.

19. The device of claim 14, wherein said dielectric layer includes atoms of aluminum and iron.

20. The device of claim 14, wherein said dielectric layer includes atoms of aluminum, cobalt and silicon.

21. The device of claim 14, wherein said dielectric layer includes atoms of aluminum, iron and silicon.

22. The device of claim 14, wherein said dielectric layer includes an oxidized alloy of aluminum.

23. The device of claim 14, wherein said dielectric layer includes a nitridized alloy of aluminum.

24. The device of claim 14, wherein said dielectric layer includes a nitridized alloy of aluminum, and said alloy is a single phase solid at 600ºC.

25. The device of claim 14, wherein at least one of said first and second ferromagnetic layers includes a half-metallic magnet.

26. A device comprising:

a first electrode including a first magnetic layer having a magnetic moment with a direction that is substantially fixed in response to an applied magnetic field;

a second electrode including a second magnetic layer having a magnetic moment with a direction that is variable in response to said applied magnetic field; and

a dielectric layer separating said first and second magnetic layers, having a thickness of less than five nanometers and containing a magnetic element substantially uniformly dispersed in an atomic concentration of less than about five percent;

wherein an electrical current between said electrodes depends upon an orientation of said second magnetic moment relative to that of said first magnetic moment.

27. The device of claim 26, wherein said device is a part of an electromagnetic transducer.

28. The device of claim 26, wherein said device is a part of a solid-state memory.

29. The device of claim 26, wherein said second ferromagnetic layer has an easy axis of magnetization that is substantially parallel to said magnetic moment direction of said first ferromagnetic layer.

30. The device of claim 26, wherein said second ferromagnetic layer has an easy axis of magnetization that is substantially perpendicular to said magnetic moment direction of said first ferromagnetic layer.

31. The device of claim 26, wherein said dielectric layer includes atoms of aluminum and iron.

32. The device of claim 26, wherein said dielectric layer includes atoms of aluminum, cobalt and silicon.

33. The device of claim 26, wherein said dielectric layer includes atoms of aluminum, iron and silicon.

34. The device of claim 26, wherein said dielectric layer includes an oxidized alloy of aluminum.

35. The device of claim 26, wherein said dielectric layer includes a nitridized alloy of aluminum.

36. The device of claim 26, wherein said dielectric layer includes an nitridized alloy of aluminum, and said alloy is a single phase solid at 600ºC.

37. The device of claim 26, wherein at least one of said first and second ferromagnetic layers includes a half-metallic magnet.